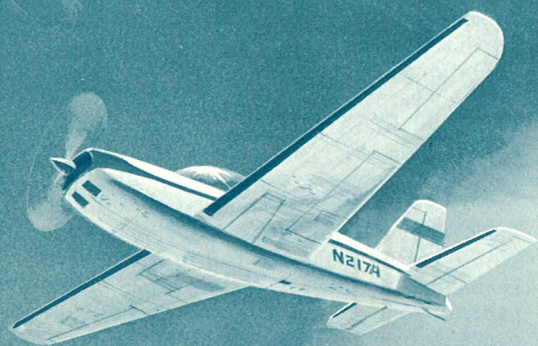


A PILOT'S GUIDE TO AVIATION WEATHER SERVICES



U.S. DEPARTMENT OF COMMERCE
Environmental Science Services Administration

THE NATIONAL AVIATION WEATHER SYSTEM is the most complete ever made available to general aviation pilots. This brochure is designed to help you use the system to the fullest extent, through the aviation weather services of the ESSA Weather Bureau and the Federal Aviation Administration. Use it regularly—and fly safely!

PRE-FLIGHT

Continually updated short-flight forecasts are provided by continuous **Transcribed Weather Broadcasts (TWEB)** and the **Pilot's Automatic Telephone Weather Answering Service (PATWAS)**.

For longer flights, a telephone call or visit to the nearest **FAA Flight Service Station (FSS)** or **ESSA Weather Bureau Airport Station (WBAS)** is necessary. In marginal weather, briefers are busy and telephone delays are common. While you wait, get basic information from TWEB and PATWAS—but do make the call to the briefer. Remember that new aviation weather observations from distant stations are normally available by 10 minutes past the hour.

After receiving weather information, either for short or long-range flights, consider carefully whether conditions are suitable for your flight. **If not, delay your flight.**

IN-FLIGHT

Weather information is available by calling any FAA/FSS facility within radio range. Selected FSS's broadcast current weather reports, in-flight advisories, PIREPs, RAREPs, and NOTAMs at 15 and 45 minutes past every hour. TWEB also can be received in the air. **Monitor weather broadcasts routinely and do not hesitate to request specific information from FAA/FSS.**

BEFORE LANDING

At many terminals, information helpful to landing and takeoff is continuously broadcast over a navigational aid frequency. Prior to descent, request current weather for terminal area as well as field conditions at destination.

During marginal conditions, keep a particularly close check on en route, terminal, and alternate terminal weather.

Conversion Tables

TIME

STANDARD TO GMT

Eastern	+ 5 hr = GMT
Central	+ 6 hr = GMT
Mountain	+ 7 hr = GMT
Pacific	+ 8 hr = GMT
Yukon	+ 9 hr = GMT
Alaskan	+ 10 hr = GMT
Bering	+ 11 hr = GMT

Add one less hour for Daylight Time.

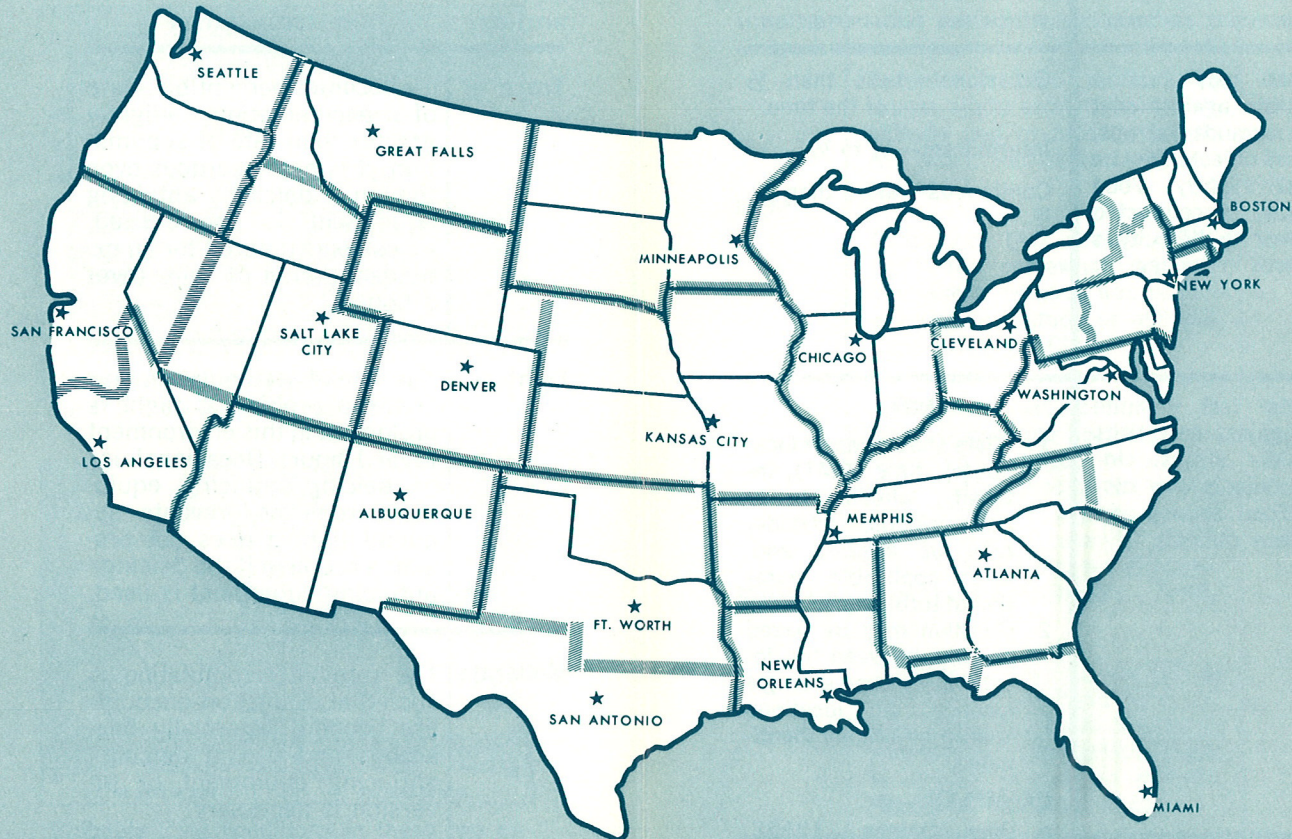
WINDSPEED

MPH	Knots
1-2	1-2
3-8	3-7
9-14	8-12
15-20	13-17
21-25	18-22
26-31	23-27
32-37	28-32
38-43	33-37
44-49	38-42
50-54	43-47
55-60	48-52
61-66	53-57
67-71	58-62
72-77	63-67
78-83	68-72
84-89	73-77
119-123	103-107

Knots x 1.15 =
Miles Per Hour
Miles Per Hour x
0.869 = Knots



Flight Advisory Weather Service (FAWS) Centers



AREA FORECASTS (FA)

—at 0045Z + each 6 hours.

TERMINAL FORECASTS

12-hour (FT1)

—at 0445Z + each 6 hours.

24-hour (FTUS24)

—at 0520Z + each 6 hours.

IN-FLIGHT ADVISORIES (FL)

—as required.

SIGMET (for all aircraft)

AIRMET (for small aircraft)

AREA FORECASTS are amended by **AIRMET** and **SIGMET**

WINDS/TEMPERATURES ALOFT FORECASTS (FD)

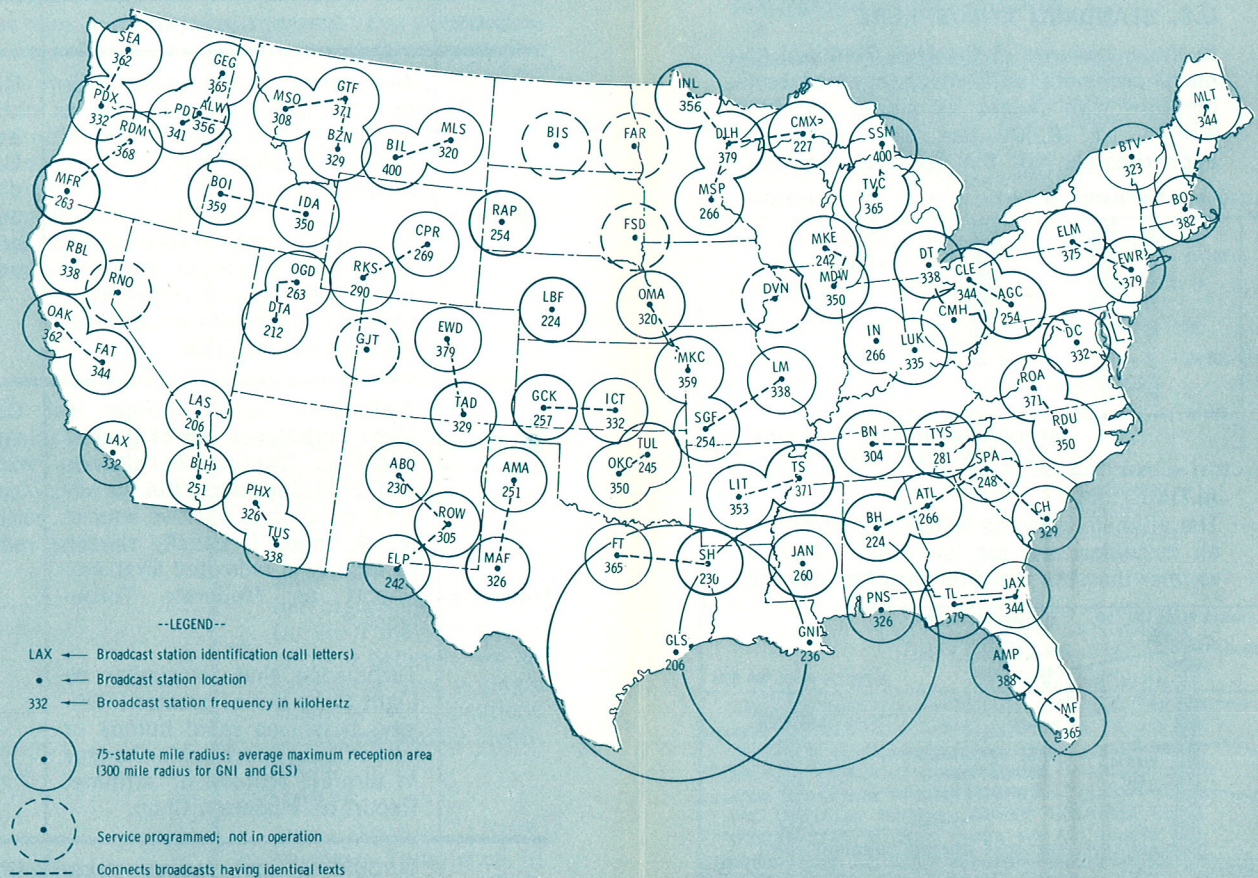
Prepared by National Meteorological Center
(call letters, WBC)

Contain upper-air temperature forecasts

Issued for 98 locations in 48 States

Winds for in-between points can be obtained
by interpolation

Transcribed Weather Broadcast Service (TWEB)



Forecast texts are prepared and furnished to FAA for dissemination via the continuous **Transcribed Weather Broadcasts (TWEB)** and the **Pilots Automatic Telephone Weather Answering Service (PATWAS)**. These texts serve as weather briefings for local or limited cross-country flights. There are 81 TWEB outlet locations in the conterminous states. The TWEB outlet locations in the 48 States are shown above. Telephone numbers for PATWAS outlets in the conterminous states are shown in the panel at right.

TRANSCRIBED WEATHER BROADCAST SERVICE (TWEB) provides:

- Continuous weather information for 250-mile radius of outlet
- Identification
- Synopsis
- Flight Precautions
- Forecast Summary
- Winds Aloft
- PIREPs.
- RAREPs.
- Surface Weather Reports
- NOTAMs

Pilot's Automatic Telephone Weather Answering Service (PATWAS)

PATWAS offers transcribed weather forecasts by telephone for a 250-mile radius of service in 45 U.S. cities. It gives the same information as TWEB, with the exception of RAREPs, PIREPs, and Reports.

Following are PATWAS telephone numbers, by cities:

Albuquerque, N. Mex.	505-242-2661	
Atlanta, Ga.	404-755-6608	
Baltimore, Md.	301-766-0757	
Birmingham, Ala.	205-595-2101	
Boston, Mass.	617-569-1773	
Buffalo, N.Y.	716-632-5042	
Charleston, S.C.	803-747-5778	
Chicago, Ill.	312-667-5055	
Cincinnati, Ohio	513-871-6200	
Cleveland, Ohio	216-267-3410	
Dallas, Tex.	214-FL7-4343	
Denver, Colo.	303-388-3653	
	303-398-3967	
Detroit, Mich.	313-372-1711	
El Paso, Tex.	915-778-4487	
Fort Worth, Tex.	817-MA6-3071	
Houston, Tex.	713-644-1507	
Indianapolis, Ind.	317-244-2411	
Jacksonville, Fla.	904-353-8605	
Kansas City, Mo.	816-471-2131	
816-HA1-8022 NW	816-HA1-3080	SE
816-HA1-2955 NE	816-HA1-0919	SW
Los Angeles, Calif.	213-776-1640	
	213-787-4911	
	213-546-0595	
	213-639-2647	
Memphis, Tenn.	901-398-2347	
Miami, Fla.	305-635-7573	
Milwaukee, Wis.	414-744-7810	
Minneapolis, Minn.	612-729-9339	
Nashville, Tenn.	615-255-8732	
Newark, N.J.	201-624-7272	
New Orleans, La.	504-241-2351	
New York City, N.Y.	212-656-7474	
Oakland, Calif.	415-569-0313	
(0500-2300 local time)		
Oklahoma City, Okla.	405-W13-9873	
Omaha, Nebr.	402-342-3603	
Philadelphia, Pa.	215-726-3503	
(0600-2300 local time)		
Pittsburgh, Pa.	412-462-5585	
	412-462-5586	
Portland, Oreg.	503-282-2285	
Salt Lake City, Utah	801-364-5571	
(0700-2400 local time)		
St. Louis, Mo.	314-731-3004	
	314-848-3303	
St. Petersburg, Fla.	813-527-4888	
San Francisco, Calif.	415-589-6711	
(0500-2300 local time)		
San Jose, Calif.	408-263-0123	
(0500-2300 local time)		
Seattle, Wash.	206-682-3655	
Shreveport, La.	318-635-7769	
Tampa, Fla.	813-229-1708	
Tulsa, Okla.	918-835-2364	
Washington, D.C.	202-347-8016	
	202-D17-4950	
Wichita, Kans.	316-942-3284	

Contractions

WEATHER BUREAU FORECAST TERMS

ACFT	aircraft	LWR	lower
ACTV	active	LVR	layer
AFDK	after dark	MDT	moderate
AGL	above	MRTM	maritime
	ground level	MSL	mean sea level
AGN	again		
ALF	aloft	MXD	mixed
AMS	air mass	NMI	nautical mile(s)
ARND	around	NMRS	numerous
ASL	above sea level	NOTAM	notice to airman
BFDK	before dark		
BKN	broken	OBSC	obscure
BLZD	blizzard	OCNL	occasional
BRF	brief	OCNL	occasionally
BTN	between	OCR	occur
BTR	better	OTLK	outlook
BYD	beyond		
CAT	clear air turbulence	OTRW	otherwise
CHG	change	OVC	overcast
CIG	ceiling	PCPN	precipitation
CONT	continue	PIREP	pilot report
		PRST	persist
CSDRBL	considerable	PSBL	possible
CVR	cover	PSG	passing, passage
DCR	decrease	PVL	prevail
DMSH	diminish	RAREP	radar report
DNS	dense	RESTR	restrict
DRZL	drizzle		
DSIPT	dissipate	RDG	ridge
DVLP	develop	RGD	ragged
EMBDD	embedded	RMN	remain
EXTRM	extreme	RPD	rapid
		RTE	route
EXTSV	extensive		
FCST	forecast	RUF	rough
FLRY	flurry	SCTD	scattered
FORN	forenoon	SCTR	sector
FQT	frequent	SHFT	shift
		SHWR	shower
FROPA	frontal passage	SLD	solid
FROSFC	frontal surface	SLT	sleet
	ground fog	SMK	smoke
GNDFG	gradual	SNW	snow
GRDL	height	SQLN	squall line
HGT			
HLSTO	hailstones	STBL	stable
HND	hundred	STG	strong
HURCN	hurricane	SVR	severe
HVY	heavy	TOVC	top of overcast
ICGIC	icing in clouds	TSHWR	thunder-shower
ICGIP	icing in precipitation	TSTM	thunder-storm
IMDT	immediate	TURBC	turbulence
INCR	increase	TWD	toward
INTMT	intermittent	UPSLP	up slope
INTSFY	intensify	VRBL	variable
ISOLD	isolated	VSBY	visibility
JTSTR	jet stream	WDLY	widely
KT	knot(s)	WEA	weather
LGT	light	WK	weak
LMT	limit	WV	wave
LVL	level	WX	weather

Information for Weather Briefer



Be sure to give your weather briefer—

- Name and/or aircraft number
- Type of aircraft
- VFR or IFR
- Route and terminal stops
- Time of flight—departure and arrival

Name _____

Address _____

Aircraft Number _____

**PILOTS REPORT IN-FLIGHT WEATHER TO
NEAREST FSS**

AVIATION WEATHER BRIEFING TELEPHONE NUMBERS MOST USED

Facility/Location	Area Code	Number

ESSA/PI 680020

1969

Key to Aviation Weather Reports

LOCATION IDENTIFIER AND TYPE OF REPORT *	SKY AND CEILING	VISIBILITY AND WEATHER OBSTRUCTION TO VISION	SEA-LEVEL PRESSURE	TEMPERATURE AND DEW POINT	WIND	ALTIMETER SETTING	RUNWAY VISUAL RANGE	CODED PIREPS
MKC	150M250	4R-K	132	/58/56	/1807	/993/	R04LVR20V40	/055

SKY AND CEILING

Sky cover symbols are in ascending order. Figures preceding symbols are heights in hundreds of feet above station.

Sky cover symbols are:

- Clear: Less than 0.1 sky cover.
- ⊙ Scattered: 0.1 to less than 0.6 sky cover.
- ⊕ Broken: 0.6 to 0.9 sky cover.
- ⊖ Overcast: More than 0.9 sky cover.
- Thin (When prefixed to the above symbols.)
- X Partial obscuration: 0.1 to less than 1.0 sky hidden by precipitation or obstruction to vision (bases at surface).
- × Obscuration: 1.0 sky hidden by precipitation or obstruction to vision (bases at surface).

Letter preceding height of layer identifies ceiling layer and indicates how ceiling height was obtained. Thus:

A	Aircraft	W	Indefinite
B	Balloon (Pilot or ceiling)	U	Height of cirriform ceiling layer unknown.
D	Estimated height of cirriform clouds on basis of persistency	/	Height of cirriform non-ceiling layer unknown.
E	Estimated heights of noncirriform clouds	"V"	Immediately following numerical value indicates a varying ceiling
M	Measured		
R	Radiosonde Balloon or Radar		

VISIBILITY

Reported in statute miles and fractions. (V = Variable)

WEATHER AND OBSTRUCTION TO VISION SYMBOLS

A	Hail	GF	Ground Fog
AP	Small Hail	H	Haze
BD	Blowing Dust	IC	Ice Crystals
BN	Blowing Sand	IF	Ice Fog
BS	Blowing Snow	K	Smoke
D	Dust	L	Drizzle
E	Sleet	R	Rain
EW	Sleet Showers	RW	Rain Showers
F	Fog	S	Snow

SG Snow Grains
SP Snow Pellets
SW Snow Showers

T Thunderstorms
ZL Freezing Drizzle
ZR Freezing Rain

Precipitation intensities are indicated thus: — Very Light; — Light; (no sign) Moderate; + Heavy

WIND

Direction in tens of degrees from true north, speed in knots. 0000 indicates calm. G indicates gusty. Peak speed of gusts follows G or Q when squall is reported. The contraction WSHFT followed by local time group in remarks indicates windshift and its time of occurrence.

EXAMPLES: 3627 360 Degrees, 27 knots; 3627G40 360 Degrees, 27 knots Peak speed in gusts 40 knots.

ALTIMETER SETTING

The first figure of the actual altimeter setting is always omitted from the report.

RUNWAY VISUAL RANGE (RVR)

RVR is reported from some stations. Extreme values for 10 minutes prior to observation are given in hundreds of feet. Runway identification precedes RVR report.

CODED PIREPS

Pilot reports of clouds not visible from ground are coded with MSL height data preceding and/or following sky cover symbol to indicate cloud bases and/or tops, respectively.

DECODED REPORT

Kansas City: Record observation, 1500 feet scattered clouds, measured ceiling 2500 feet overcast, visibility 4 miles, light rain, smoke, sea-level pressure 1013.2 milibars temperature 58°F, dewpoint 56°F, wind 180°, 7 knots, altimeter setting 29.93 inches. Runway 04 left, visual range 2000 feet variable to 4000 feet. Pilot reports top of overcast 5500 feet.

*TYPE OF REPORT

The omission of type-of-report data identifies a scheduled record observation for the hour specified in the sequence heading; the time of an out-of-sequence special observation is given as "S" followed by a time group (24-hour clock GMT) e.g., "PIT S 0715—XM . . ." A special indicates a significant change in one or more elements. Local reports are identified by "LCL" and a time group. Locals are transmitted on local teletypewriter circuits only.

Key to Aviation Weather Forecasts

TERMINAL FORECASTS contain information for specific airports on ceiling, cloud heights, cloud amounts, visibility, weather condition, and surface wind. They are written in a form similar to the AVIATION WEATHER REPORT.

CEILING: Identified by the letter "C"

CLOUD HEIGHTS: In hundreds of feet above the station (ground)

CLOUD LAYERS: Stated in ascending order of height

VISIBILITY: In statute miles but omitted if over 8 miles

SURFACE WIND: In tens of degrees and knots; omitted when less than 10.

EXAMPLE OF TERMINAL FORECASTS

C15 ☉ { Ceiling 1500', broken clouds
Scattered clouds at 2000', ceiling 7000' overcast, visibility 6 miles, smoke, surface wind 320 degrees 30 knots, gusty.

20 ☉ C70 ☉ 6K 3230G { Sky obscured, vertical visibility 500', visibility one-fourth mile, moderate snow.

C5X1/4S { Sky obscured, vertical visibility 500', visibility one-fourth mile, moderate snow.

AREA FORECASTS are 12-hour forecasts plus 12-hour **OUTLOOKS** (18-hour outlook in FA valid at 1300Z) of cloud, weather and frontal conditions for an area the size of several States. Heights of cloud tops, icing, and turbulence are **ABOVE SEA LEVEL (ASL)**; ceiling heights, **ABOVE GROUND LEVEL (AGL)**; bases of cloud layers are ASL unless indicated. Area Forecasts are amended by **SIGMETs** or **AIRMETs**.

SIGMET or **AIRMET** warn airmen in flight of potentially hazardous weather such as squall lines, thunderstorms, fog, icing, and turbulence. **SIGMET** concerns severe and extreme conditions of importance to all aircraft. **AIRMET** concerns less severe conditions which may be hazardous to some aircraft or to relatively inexperienced pilots. Both are broadcast by FAA on NAVAIID voice channels.

WINDS (AND TEMPERATURES) ALOFT FORECASTS are 12-hour forecasts of wind direction (nearest 10° true N) and speed (knots) for selected flight levels. Temperatures aloft (°C) are included for all but the 3000-foot level.

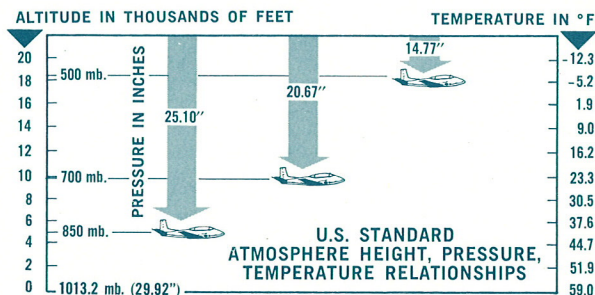
FORMAT OF WINDS ALOFT FORECAST LVL 3000 6000 FT 9000 12000 FT MLT 2925 2833+00 2930-03 3030-06

At 6000' ASL wind from 280° at 33 knots with temperature 0° Celsius

Pressure and the Altimeter

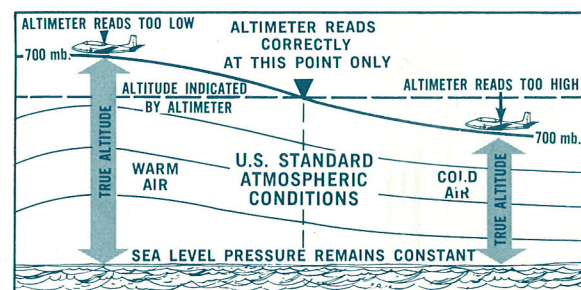
U.S. STANDARD ATMOSPHERE

In these features of the U.S. Standard Atmosphere, note uniform changes of temperature with height as shown on right margin. At 18,000 feet, air pressure is approximately half the sea-level pressure.

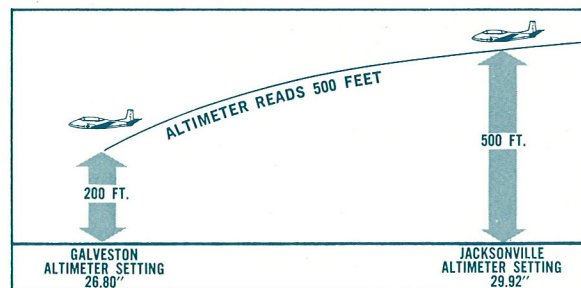


ALTIMETERS

The altimeter reading is too high when the air is colder, and too low when the air is warmer than the U.S. Standard Atmosphere.



The true height of the airplane changes when the surface pressure changes if the pilot flies at a constant indicated altitude and does not reset his altimeter.



Reporting Turbulence

INTENSITY	AIRCRAFT REACTION	REACTION INSIDE AIRCRAFT	REPORTING TERM-DEFINITION
Light	Turbulence that momentarily causes slight erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as Light Turbulence.*	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.	Occasional—Less than $\frac{1}{3}$ of the time. Intermittent— $\frac{1}{3}$ to $\frac{2}{3}$. Continuous—More than $\frac{2}{3}$.
	or Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as Light Chop.		
Moderate	Turbulence that is similar to Light Turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as Moderate Turbulence.*	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.	NOTE 1. Pilots should report location(s), time (GMT), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, duration of turbulence. 2. Duration may be based on time between two locations or over a single location. All locations should be readily identifiable. EXAMPLES: a. Over Omaha, 1232Z, Moderate Turbulence, in cloud, Flight Level 310, B707. b. From 50 miles south of Albuquerque to 30 miles north of Phoenix, 1210Z to 1250Z, occasional Moderate Chop, Flight Level 330, DC8.
	or Turbulence that is similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as Moderate Chop.		
Severe	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as Severe Turbulence.*	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.	
Extreme	Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as Extreme Turbulence.*		

* High level turbulence (normally above 15,000 feet ASL) not associated with cumuliform cloudiness, including thunderstorms, should be reported as CAT (Clear Air Turbulence) preceded by the appropriate intensity, or light or moderate chop.
SC/AMS Meeting 7/67

Reporting Airframe Icing

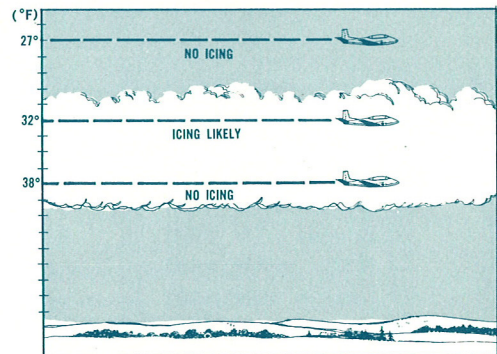
INTENSITY	ICE ACCUMULATION
Trace	Ice becomes perceptible. Rate of accumulation slightly greater than rate of sublimation. It is not hazardous even though deicing / anti-icing equipment is not utilized, unless encountered for an extended period of time (over 1 hour).
Light	The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of deicing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the deicing/anti-icing equipment is used.
Moderate	The rate of accumulation is such that even short encounters become potentially hazardous and use of deicing/anti-icing equipment or diversion is necessary.
Severe	The rate of accumulation is such that deicing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary. APPROVED SC/AMS Meeting 4/68

Pilot Report: Aircraft Identification, Location, Time (GMT), Intensity of Type,* Altitude/FL, Aircraft Type, IAS.

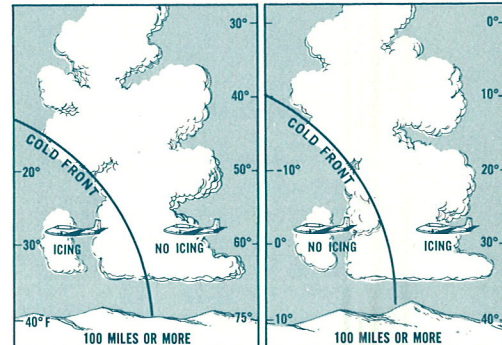
*Rime Ice: Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

Clear Ice: A glossy, clear, or translucent ice formed by the relatively slow freezing of large supercooled water droplets.

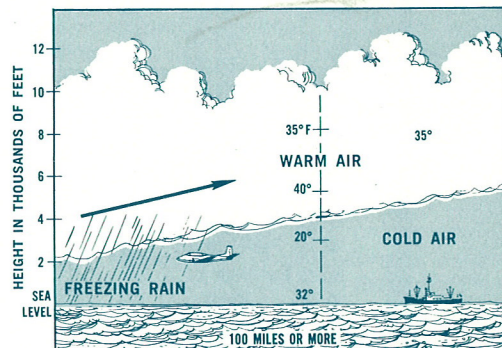
Icing Conditions



Ice forms when temperature is below freezing and there is visible moisture.



Probable icing conditions in these two examples of cold fronts are dissimilar because of different air mass temperatures.



Example of freezing rain under a warm front.